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Anisotropic magnetic susceptibility and crystal field analysis in the Van Vleck paramagnet PrF3

Savinkov A., Irisov D., Malkin B., Safiullin K., Suzuki H., Tagirov M., Tayurskii D.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The magnetic susceptibility of PrF3 was measured in an external magnetic field of 0.01T directed across and along the crystallographic c-axis at temperatures in the range 2-300K. The maximum values of the measured susceptibilities (less than 1.2 × 10-4emug-1) are consistent with the expected pattern of non-degenerate energy levels of the electronic 4f2 configuration in the low-symmetry crystal field. The longitudinal susceptibility decreases monotonically with the temperature increase while the transversal susceptibility has a broad maximum at 60K. A crystal field analysis based on the magnetic susceptibility data and calculations in the framework of the exchange charge model was carried out. The set of crystal field parameters related to the crystallographic system of coordinates has been obtained and used to reproduce successfully the temperature dependences of the longitudinal and transversal components of the susceptibility tensor and the crystal field energies, as well as the parameters of the effective spin Hamiltonian of the 141Pr nuclei. © 2006 IOP Publishing Ltd.

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